

METHOD AND APPARATUS FOR PREPARATION OF FOOD PRODUCT

BACKGROUND OF THE INVENTION

This invention relates to a method for preparing a food product. More particularly, this invention relates to a method useful in preparing a filled food product.

- 5 The invention also relates to an associated apparatus for preparing a food product. The apparatus is especially useful in preparing discrete food articles such as filled bagels.

The tastiest parts of certain baked food products such as muffins and bagels are those which are browned owing to exposure to an oven's convection currents. In eating muffins, people frequently separate the crowns from the bodies of the muffins in order to
10 savor the enhanced flavor of the crowns. Likewise, in eating bagels, some people characteristically remove the inner, doughy parts of the bagel and eat only the shell, either alone or with filling such as a cream cheese and scallion spread or a salmon spread. Where a bagel is used to make a sandwich type food item, the hollowing out of the bagel provides the additional advantage of reducing the amount of filling that is
15 squeezed out from between the bagel halves when the consumer bites into the bagel. Concomitantly, a hollow bagel is able to accommodate a greater amount of filling material.

A problem with the conventional manual method of removing dough from the interior of a bagel is inconvenience to the consumer. Another problem is waste that
20 occurs when the removed interior dough is discarded rather than eaten.

Although certain food products such as doughnuts are frequently made with hollow interiors, into which a cream or fruit filling may be deposited, the method by

which that hollow interior is formed is not applicable to bagels. Doughnuts can be made from a dough which separates during deep frying to produce an interior chamber.

Bagels are cooked by an initial boiling step and a subsequent baking step. Bagels with hollow interiors will not naturally form during the two-step cooking process.

5 U.S. Patent No. 5,807,599 describes a method for making a food product which utilizes an aliquot of dough disposed in a predetermined shape about a cooking member made of a material which has a chemical composition essentially impervious to cooking temperatures. The dough is cooked, e.g., boiled or baked, at a predetermined temperature for a predetermined period. The cooking member is maintained in the
10 dough during the cooking thereof. After the cooking of the dough at the predetermined temperature for the predetermined period, the cooking member is removed from the cooked dough, thereby creating a chamber in the cooked dough.

Generally, as described in U.S. Patent No. 5,807,599, the dough is molded about the cooking member to form the predetermined dough shape about the cooking
15 member. Alternatively, the cooking member may be inserted or pressed into a lump of the dough.

According to U.S. Patent No. 5,807,599, the cooking member is an elongate member made of a flexible material such as silicone. In that case, the elongate member may be bent to assume a desired form such as a circle. The dough generally conforms
20 to the bent cooking member. The dough has a toroidal shape when the cooking member is bent into a circle.

As disclosed in U.S. Patent No. 5,807,599, an end of the elongate member is left

protruding from the uncooked dough form. After the dough is cooked, the elongate member is removed from the dough by grasping the protruding end of the elongate member and pulling the elongate member from the cooked dough. An edible filling may be injected or otherwise deposited into the chamber of the hollow dough cooked product
5 after the pulling of the elongate member from the cooked dough.

OBJECTS OF THE INVENTION

An object of the present invention is to provide a method and/or an associated apparatus useful in the production of a food product having an internal chamber containing an edible composition.

10 Another, more specific, object of the present invention is to provide a method and/or an associated apparatus for injecting a flowable edible composition into a food product having an internal chamber.

A further specific object of the present invention is to provide a method and/or an associated apparatus for producing an uncooked food product including dough
15 disposed about a removable cooking insert.

It is an additional object of the present invention to provide such a method and/or apparatus which is useful in producing a hollow bagel provided with a filling.

A supplemental object of the present invention is to provide an automated method of manufacturing a food product which is provided with a filling.

20 These and other objects of the present invention will be apparent from the descriptions and illustrations herein. It is to be noted that each of the above objects is attained by at least one embodiment of the invention. However, no embodiment of the

invention need attain all of the above-listed objects.

SUMMARY OF THE INVENTION

A bagel filling kit comprises, in accordance with the present invention, a plurality of hollow tubular members, and a plurality of plunger members insertable into respective
5 ones of the tubular members. The tubular members may be preloaded with respective charges of flowable comestible materials. The flowable comestible materials may include such foods as tuna fish salad, whitefish salad, salmon fish salad, chopped liver salad, various cream cheese or tofu pastes.

Optionally, the plunger members are partially inserted into respective tubular
10 members. Where the tubular members are preloaded, the user need only select a tubular member with a desired filling, insert a nozzle end of the tubular member into a hole in a bagel, where the hole communicates with a chamber inside the bagel, and push the plunger to thereby eject the filling material into the bagel. The tubular member, plunger and charge of comestible material may be designed as a single-use, disposable
15 assembly. In that case, the charge of comestible material is advantageously premeasured to fill exactly one bagel.

Pursuant to another feature of the present invention, the tubular members are arcuate. That shape facilitates an insertion of a tubular member through a hole in a bagel into a toroidal chamber formed in the bagel, as discussed in U.S. Patent No.
20 5,807,599. Where the tubular member is arcuate, the shaft or the plunger member may be either substantially rigid with the same arcuate shape, or resiliently flexible. In the latter case, the flexibility of the plunger shaft facilitates a conformation of the plunger

member to the lumen of the tubular member.

Pursuant to a further feature of the present invention, the kit additionally comprises a plurality of handles removably attachable to respective tubular members.

In a simple embodiment, the tubular members are each provided with at least one

5 aperture for receiving a part (e.g., a flange) of a respective one of the handles. In an

alternative embodiment, the tubular members are provided with attached handles. In

any event, a handle functions to facilitate manipulation of the tubular member and is

especially useful where the tubular member is loaded with a charge of comestible

material by the ultimate user. The user grips the tubular member by the handle and

10 pushes the tubular member to partially into and along a bed of flowable comestible filling

material, thereby forcing the filling material into the tubular member. This loading

process may be undertaken with the plunger member attached to or detached from the

tubular member.

Accordingly, a method pursuant to the present invention for producing a filled

15 food product works on a piece of comestible material or food product (e.g., a bagel)

provided with a preformed internal chamber and an access opening communicating with

the internal chamber. The method utilizes a hollow tubular member with at least one

open end, a plunger member, and a quantity of flowable comestible filling material. The

hollow tubular member is manipulated to move the open end of the tubular member

20 along the quantity of flowable comestible material so that some of the flowable

comestible material enters the tubular member to load the tubular member. Thereafter

a tip of the loaded tubular member is inserted through the access opening in the food

product and the plunger member is pushed to eject flowable comestible material from the loaded tubular member into the internal chamber of the food product.

Subsequently, the tip of the tubular member is removed from the filled food product.

Generally, the plunger member is inserted into an end of the tubular member opposite
5 the tip prior to the pushing of the plunger member to eject the flowable material into the chamber of the food product.

As discussed above with respect to the kit, a handle may be attached to the tubular member prior to the manipulating of the tubular member.

A method for forming a food product (such as a hollow bagel preform) utilizes, in
10 accordance with the present invention, a cooking insert having a 9- or 6-shape including a generally circular portion and a tail portion. The method comprises disposing a first piece of generally flattened dough material on a support having a projection so that a central region of the first piece of generally flattened dough material is located over the projection. The cooking insert is then placed on the first piece of generally flattened
15 dough material so that the circular portion of the insert encircles the central region of the dough piece and the projection of the underlying support. A second piece of generally flattened dough material is deposited over the first piece of generally flattened dough material and at least the circular portion of the placed cooking insert. Subsequently, the second piece of generally flattened dough material is pressed to the first piece of
20 generally flattened dough material along an inner circle inside the circular portion of the cooking insert and along an outer circle outside the circular portion of the cooking insert, thereby sealing the first and the second piece of generally flattened dough material to

one another along radially inner and outer zones. Also subsequent to the deposition of the second piece of generally flattened dough material over the first piece of generally flattened dough material, the first piece of generally flattened dough material and the second piece of generally flattened dough material are cut proximate to and along the inner circle and the outer circle along which the pressing occurs. The cutting of the dough may take place concurrently with, prior to, or subsequently to the pressing of the first and the second piece of generally flattened dough material to one another.

It is contemplated that this manufacturing method is implement chiefly automatically. In particular, the pressing of the second piece of generally flattened dough material to the first piece of generally flattened dough material and the cutting of the first piece of generally flattened dough material and the second piece of generally flattened dough material are implemented automatically. In addition, the disposing of the first piece of generally flattened dough material and the depositing of the second piece of generally flattened dough material may be performed automatically.

A machine for filling a comestible product such as a hollow bagel comprises, in accordance with the present invention, a carousel having an axis of rotation and a plurality of tubular members attached to the carousel, the tubular members being oriented parallel to the axis and in angularly spaced relation to one another about the axis. A plurality of pistons each disposed in a respective one of the tubular members, while an actuator is disposed in operative engagement with the pistons for shifting the pistons parallel to the axis to eject flowable material through openings at lower ends of the tubular members. Means may be operatively connected to the tubular members for

limiting the amounts of ejected flowable material to a predetermined fixed quantity.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a diagram of successive steps in a method for making a hollow bagel.

Fig. 2 is a schematic side elevational view of an automated assembly-line-type
5 machine for forming a bagel preform which is cooked in boiling and baking steps
illustrated in Fig. 1.

Fig. 3 is a schematic partial top plan view of a conveyor shown in Fig. 2.

Fig. 4 is a schematic side elevational view of an automated assembly-line-type
machine for automatically removing an arcuate flexible insert or cooking member from a
10 cooked bagel.

Fig. 5 is a diagram of successive steps in a method for making a bagel with a
filled center.

Fig. 6 is a schematic side perspective view of an assembly for filling a bagel in
accordance with the present invention, showing the assembly in a disassembled state.

15 Fig. 7 is a view similar to Fig. 6, showing the filling assembly of that drawing
figure in an assembled and loaded state.

Fig. 8 is a view similar to Fig. 7, showing the filling assembly of that drawing
figure in a filling discharged state.

Fig. 9 is a schematic side perspective view of the assembled and loaded filling
20 assembly of Fig. 8 for injecting a filling into a bagel formed pursuant to the method of
Figs. 1-4.

Fig. 10 is a schematic side perspective view of a modified filling injection

assembly in accordance with the invention.

Fig. 11 is a schematic side perspective view of a modified tubular filling member in accordance with the invention.

Fig. 12 is a pair of side perspective views of a flexible resilient plunger member showing that member in a straight and a flexed configuration for use with the tubular member of Fig. 11.

Fig. 13 is a schematic perspective view of a kit of filling assemblies shown singularly in Fig. 6.

Fig. 14 is a schematic perspective view of a kit of assembled filling assemblies, in accordance with the present invention.

Fig. 15 is a exploded perspective view of a tubular member and an associated handle of another filling assembly in accordance with the present invention.

Fig. 16 is a schematic perspective view of the tubular member and handle of Fig. 15 coupled to one another.

Fig. 17 is a schematic perspective view of the tubular member and handle of Fig. 16, showing a step in the use of that assembly in a process for filling a bagel with a chamber.

Fig. 18 is a exploded perspective view of a tubular member and an associated handle of yet another filling assembly in accordance with the present invention.

Fig. 19 is a schematic perspective view of the tubular member and handle of Fig. 18 coupled to one another.

Fig. 20 is a diagram of successive steps in a method for making a bagel with a

hollowed center, in accordance with the present invention.

Fig. 21 is a schematic perspective view of a support plate for forming a doughy bagel preform surrounding a cooking insert, in accordance with the present invention.

Fig. 22 is partially a schematic perspective view and partially a block diagram of a device for forming doughy bagel preform surrounding a cooking insert, in accordance with the present invention.

Figs. 23A through 23F are schematic cross-sectional views of a support plate or platform, dough sections and selected parts of the device of Fig. 22, showing successive steps in the production of a doughy bagel preform using the device of Fig. 22.

Fig. 24 is a schematic perspective view, partially broken away, of a manually operated bagel filling machine in accordance with the present invention.

Fig. 25 is a schematic perspective view of another manually operated bagel filling machine in accordance with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As illustrated in Fig. 1, an elongate cooking member 10 for use in baking a hollow cooked food product such as a bagel is made of a flexible low-friction material which is impervious to boiling and baking temperatures. Such a material is silicone with a durometer hardness measurement of less than 30.

Cooking member 10 is bent into an arcuate, specifically a circular, form 12. Then a predetermined aliquot of bagel dough 14 is molded about the circularly bent cooking member 12 to produce a toroidal dough preform 16 in which the cooking member 12 is

embedded. An end portion 18 of cooking member 10 protrudes from preform 16.

Preform 16 including circularly bent cooking member 12 is now ready for cooking by traditional steps of boiling, schematically represented at 20, and baking, schematically represented at 22 in Fig. 1. After the bagel preform has been baked, protruding end portion 18 is grasped, e.g., by a pliers 24 and pulled from the baked food item 26 to generate a hollow chamber 28.

As further illustrated in Fig. 1, a syringe 30 or other instrument may be subsequently used to inject or otherwise deposit a filling material 32 such as cream cheese or minced meat into chamber 28. An alternative filling instrument (not illustrated) would have an elongate flexible tube which is inserted into chamber 28 and withdrawn as filling material is fed through the tube to an opening at a free end thereof. This flexible tube would advantageously be provided at a distal end with an enlarged smoothly curved surface to guide the tube along hollow chamber 28. Such a guide surface may be a surface of a balloon attached to the distal end of the flexible tube. Optionally, the balloon is alternately inflatable and deflatable. The balloon or other camming-type surface prevents the distal tip of the flexible tube from catching on the cooked dough material of the baked food item 26.

It is to be noted that preform 16 may take a form other than toroidal. a food product produced from the preform may be elongate.

The use of a cooking member as described hereinabove may be used to produce hollow food products other than bagels, such as muffins and doughnuts. Also, preform 16 with a straight or bent cooking member 12 may be produced at a first, central,

location such as a factory and shipped to remote locations (bakeries) for cooking.

It is generally contemplated that cooking element 10 has a predetermined substantially constant size. However, if a suitable material is available, it would be possible to make the cooking member as an inflatable balloon member. In that event, heating of the balloon and the gases (air) inside it during the cooking process will expand the balloon member further, if only relatively incrementally.

Fig. 2 schematically depicts a machine for automatically forming preform 16. a conveyor belt 34 is provided with a plurality of spaced bottom mold halves 36 each in turn provided with a plurality of vertically oriented pins 38. Pins 38 are slidably attached to the respective bottom mold halves 36 in order to move from a lowered neutral or storage position indicated at 40 to an elevated arrest configuration indicated at 42. Pins 38 are shifted vertically upward from lowered neutral position 40 to elevated arrest configuration 42 owing to a camming action arising from the motion of conveyor belt 34, mold halves 36 and pins 38 along a camming surface 44.

At a first station along a path of movement of belt 34 is disposed a first dough hopper 46. a door 48 provided at a lower end of hopper 46 prevents a deposition of dough onto conveyor belt 34 unless a mold half 36 is located below the hopper. At that time, door 48 is shifted sideways, as indicated by an arrow 48. After a predetermined amount of dough (not shown) has fallen from hopper 46, door 48 is shifted back into the illustrated closure position below the lower end of the hopper. a cutting edge 50 at one end of door 48 severs the predetermined amount of falling dough from the dough remaining in hopper 46.



At a second station along a path of movement of belt 34 is disposed a device 52 for bending cooking member 10 into a generally circular form. An automatically driven flexible rod 54 pushes cooking member 10 through a helical passageway or groove 56 in device 52 until the cooking member rests in a circular configuration on a door 58 at a lower end of device 52. Upon the arrival of a mold half 36 directly below device 52, door 58 is moved laterally to permit a deposition of the bent cooking member onto the dough placed into the mold half at hopper 46. The entire device 52 may be shifted temporarily downwardly to facilitate the proper deposition of the circular cooking member 10 onto the dough and inside a ring of elevated pins 28. Pins 38 serve to maintain cooking member in a curved configuration during the deposition of another predetermined amount of dough 61 from a second hopper 60 over the cooking member 10 and the first amount of dough deposited by hopper 46. Hopper 60 is provided with a reciprocable door 62 having a cutting edge 64.

At a subsequent station along the path of movement of belt 34, an upper mold half 66 having a cavity 68 is pressed onto the dough deposited by hopper 60 to shape the two aliquots of dough and connect them to one another. To that end, mold half 66 and/or mold half 36 may be provided with vibrators and other devices for ensuring that the two dough portions are intertwined with one another. Concurrently with the above described shaping or molding operation, pins 38 are withdrawn from the combined dough aliquots. This may be accomplished by several methods which will occur to one skilled in the art. a vacuum device (not shown) may ascend and contact the bottom of lower mold half 36 via a rubber seal ring. Application of vacuum will draw pins 38 from

the mold. Alternatively, an electromagnet (not shown) may be placed against the bottom of mold half 36 and energized to attach pins 38, which are advantageously made of stainless steel for contact with foodstuffs. The electromagnet may then be lowered, thereby withdrawing the pins.

5 It is to be noted that the above-described basic assembly line technique may be modified in various ways. For example, hopper 46 may be eliminated, with all of the dough being provided by hopper 60. In that case, a removable lower support is provided for the circularly bent cooking member 10. Such a lower support may comprise a plurality of additional sliding pins. The pins allow the dough to flow around
10 the cooking member during dough deposition and additionally allow the dough to flow together and close up upon the application of molding pressure by upper mold half 66.

As illustrated in Fig. 3, pins 38 are disposed in a generally circular configuration in a toroidal cavity 70 which is a mirror image of cavity 68 in upper mold half 66. Cavity 70 has an extension 71 for receiving end portion 18 (see Fig. 1) of cooking member 10.

15 After the formation of preform 16 as described above with reference to Fig. 2, boiling and baking steps are performed as described hereinabove with reference to Fig. 1. These steps may be implemented in accordance with conventional processing techniques.

Fig. 4 shows machine removal of cooking member 10 from a cooked bagel 72.

20 Bagel 72 is deposited on a conveyor belt 74 inside a ring of lowered retaining pins 76. As conveyor 74 moves along its pre-established path of transport, pins 76 are elevated by a camming surface 77 so that the pins substantially surround bagel 72, particularly

on a side thereof from which end portion 18 of cooking member protrudes from bagel

72. a grasping device 78 including a chuck or clamp 80 then grips end portion 18,

owing to operation of a rotary drive 82. a translatory drive 84 then moves grasping

device 78 away from bagel 72 while the bagel is held by retaining pins 76. The

5 removed cooking member 10 is illustrated at 86. a nozzle 88 connected to a

pressurized filling reservoir 90 is then moved into position by a drive 92 and injects

comestible filling material inside the hollow bagel 72. Techniques for injecting fluidized

comestible compositions into food preforms are well known to those skilled in the art.

Subsequent to the injection or filling operation, the completed filled bagel is

10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000
1001
1002
1003
1004
1005
1006
1007
1008
1009
1010
1011
1012
1013
1014
1015
1016
1017
1018
1019
1020
1021
1022
1023
1024
1025
1026
1027
1028
1029
1030
1031
1032
1033
1034
1035
1036
1037
1038
1039
1040
1041
1042
1043
1044
1045
1046
1047
1048
1049
1050
1051
1052
1053
1054
1055
1056
1057
1058
1059
1060
1061
1062
1063
1064
1065
1066
1067
1068
1069
1070
1071
1072
1073
1074
1075
1076
1077
1078
1079
1080
1081
1082
1083
1084
1085
1086
1087
1088
1089
1090
1091
1092
1093
1094
1095
1096
1097
1098
1099
1100
1101
1102
1103
1104
1105
1106
1107
1108
1109
1110
1111
1112
1113
1114
1115
1116
1117
1118
1119
1120
1121
1122
1123
1124
1125
1126
1127
1128
1129
1130
1131
1132
1133
1134
1135
1136
1137
1138
1139
1140
1141
1142
1143
1144
1145
1146
1147
1148
1149
1150
1151
1152
1153
1154
1155
1156
1157
1158
1159
1160
1161
1162
1163
1164
1165
1166
1167
1168
1169
1170
1171
1172
1173
1174
1175
1176
1177
1178
1179
1180
1181
1182
1183
1184
1185
1186
1187
1188
1189
1190
1191
1192
1193
1194
1195
1196
1197
1198
1199
1200
1201
1202
1203
1204
1205
1206
1207
1208
1209
1210
1211
1212
1213
1214
1215
1216
1217
1218
1219
1220
1221
1222
1223
1224
1225
1226
1227
1228
1229
1230
1231
1232
1233
1234
1235
1236
1237
1238
1239
1240
1241
1242
1243
1244
1245
1246
1247
1248
1249
1250
1251
1252
1253
1254
1255
1256
1257
1258
1259
1260
1261
1262
1263
1264
1265
1266
1267
1268
1269
1270
1271
1272
1273
1274
1275
1276
1277
1278
1279
1280
1281
1282
1283
1284
1285
1286
1287
1288
1289
1290
1291
1292
1293
1294
1295
1296
1297
1298
1299
1300
1301
1302
1303
1304
1305
1306
1307
1308
1309
1310
1311
1312
1313
1314
1315
1316
1317
1318
1319
1320
1321
1322
1323
1324
1325
1326
1327
1328
1329
1330
1331
1332
1333
1334
1335
1336
1337
1338
1339
1340
1341
1342
1343
1344
1345
1346
1347
1348
1349
1350
1351
1352
1353
1354
1355
1356
1357
1358
1359
1360
1361
1362
1363
1364
1365
1366
1367
1368
1369
1370
1371
1372
1373
1374
1375
1376
1377
1378
1379
1380
1381
1382
1383
1384
1385
1386
1387
1388
1389
1390
1391
1392
1393
1394
1395
1396
1397
1398
1399
1400
1401
1402
1403
1404
1405
1406
1407
1408
1409
1410
1411
1412
1413
1414
1415
1416
1417
1418
1419
1420
1421
1422
1423
1424
1425
1426
1427
1428
1429
1430
1431
1432
1433
1434
1435
1436
1437
1438
1439
1440
1441
1442
1443
1444
1445
1446
1447
1448
1449
1450
1451
1452
1453
1454
1455
1456
1457
1458
1459
1460
1461
1462
1463
1464
1465
1466
1467
1468
1469
1470
1471
1472
1473
1474
1475
1476
1477
1478
1479
1480
1481
1482
1483
1484
1485
1486
1487
1488
1489
1490
1491
1492
1493
1494
1495
1496
1497
1498
1499
1500
1501
1502
1503
1504
1505
1506
1507
1508
1509
1510
1511
1512
1513
1514
1515
1516
1517
1518
1519
1520
1521
1522
1523
1524
1525
1526
1527
1528
1529
1530
1531
1532
1533
1534
1535
1536
1537
1538
1539
1540
1541
1542
1543
1544
1545
1546
1547
1548
1549
1550
1551
1552
1553
1554
1555
1556
1557
1558
1559
1560
1561
1562
1563
1564
1565
1566
1567
1568
1569
1570
1571
1572
1573
1574
1575
1576
1577
1578
1579
1580
1581
1582
1583
1584
1585
1586
1587
1588
1589
1590
1591
1592
1593
1594
1595
1596
1597
1598
1599
1600
1601
1602
1603
1604
1605
1606
1607
1608
1609
1610
1611
1612
1613
1614
1615
1616
1617
1618
1619
1620
1621
1622
1623
1624
1625
1626
1627
1628
1629
1630
1631
1632
1633
1634
1635
1636
1637
1638
1639
1640
1641
1642
1643
1644
1645
1646
1647
1648
1649
1650
1651
1652
1653
1654
1655
1656
1657
1658
1659
1660
1661
1662
1663
1664
1665
1666
1667
1668
1669
1670
1671
1672
1673
1674
1675
1676
1677
1678
1679
1680
1681
1682
1683
1684
1685
1686
1687
1688
1689
1690
1691
1692
1693
1694
1695
1696
1697
1698
1699
1700
1701
1702
1703
1704
1705
1706
1707
1708
1709
1710
1711
1712
1713
1714
1715
1716
1717
1718
1719
1720
1721
1722
1723
1724
1725
1726
1727
1728
1729
1730
1731
1732
1733
1734
1735
1736
1737
1738
1739
1740
1741
1742
1743
1744
1745
1746
1747
1748
1749
1750
1751
1752
1753
1754
1755
1756
1757
1758
1759
1760
1761
1762
1763
1764
1765
1766
1767
1768
1769
1770
1771
1772
1773
1774
1775
1776
1777
1778
1779
1780
1781
1782
1783
1784
1785
1786
1787
1788
1789
1790
1791
1792
1793
1794
1795
1796
1797
1798
1799
1800
1801
1802
1803
1804
1805
1806
1807
1808
1809
1810
1811
1812
1813
1814
1815
1816
1817
1818
1819
1820
1821
1822
1823
1824
1825
1826
1827
1828
1829
1830
1831
1832
1833
1834
1835
1836
1837
1838
1839
1840
1841
1842
1843
1844
1845
1846
1847
1848
1849
1850
1851
1852
1853
1854
1855
1856
1857
1858
1859
1860
1861
1862
1863
1864
1865
1866
1867
1868
1869
1870
1871
1872
1873
1874
1875
1876
1877
1878
1879
1880
1881
1882
1883
1884
1885
1886
1887
1888
1889
1890
1891
1892
1893
1894
1895
1896
1897
1898
1899
1900
1901
1902
1903
1904
1905
1906
1907
1908
1909
1910
1911
1912
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927
1928
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
1939
1940
1941
1942
1943
1944
1945
1946
1947
1948
1949
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
2051
2052
2053
2054
2055
2056
2057
2058
2059
2060
2061
2062
2063
2064
2065
2066
2067
2068
2069
2070
2071
2072
2073
2074
2075
2076
2077
2078
2079
2080
2081
2082
2083
2084
2085
2086
2087
2088
2089
2090
2091
2092
2093
2094
2095
2096
2097
2098
2099
2100
2101
2102
2103
2104
2105
2106
2107
2108
2109
2110
2111
2112
2113
2114
2115
2116
2117
2118
2119
2120
2121
2122
2123
2124
2125
2126
2127
2128
2129
2130
2131
2132
2133
2134
2135
2136
2137
2138
2139
2140
2141
2142
2143
2144
2145
2146
2147
2148
2149
2150
2151
2152
2153
2154
2155
2156
2157
2158
2159
2160
2161
2162
2163
2164
2165
2166
2167
2168
21

remove the cooking member 10.

In an alternative process for producing a hollow comestible product such as a bagel, the function of cooking member 10 is performed by a generally rigid insert made of a dissolvable material. This material should be biologically compatible or edible, such as ice, sugar, frozen gelatin, or salt. Where a hollow bagel is cooked by boiling and baking steps, the insert may be a generally circular piece of ice with a sugar and/or salt content selected to control the rate of dissolution of the insert in the hot water of the boiling step. The salt and/or sugar content will also be selected to vary the flavoring of the eventual food product. For example, the insert might have a core of pure water and an outer layer which has a substantial sugar and/or salt concentration. In that case, the higher sugar and/or salt concentration of the outer layer of the cooking insert delays the disintegration and dissolution of the insert during the initial stages of a boiling procedure. In addition, the salt and/or sugar may be deposited in a greater or lesser concentration on an inner surface of the food product, thereby providing a desirable flavoring.

a dissolvable cooking insert may itself be hollow. During a molding procedure, dough is placed about the cooking insert so as to surround the insert. Mold forms may then close about the dough and the embedded cooking insert, to shaped the dough into a desired form.

In another alternative process for producing a comestible product such as a bagel, the function of cooking member 10 is performed by an insert made of an edible material such as a tuna fish and/or a ham and cream cheese composition. Generally,

the food material used for the cooking member or insert should be capable of being hardened, for example, by a freezing process. First the edible insert material is sculpted, molded, or otherwise shaped into the desired form. Then the shaped material is hardened, for example, by a freezing process. Alternatively, a layer of a digestible material, such as sugar or salt or a biocompatible monomer or polymer, may be formed around the basic material and hardened into a shell by a transfer of energy such as heat energy (freezing or convection cooking), electromagnetic energy (infrared radiation), vibrational energy (ultrasonic pressure waves), etc.

After the hardening of the insert or a shell layer thereof, dough is molded about the insert. The entire preform is then subjected to a cooling process. Subsequently, the insert remains in the cooking bagel (or other food product) as a filling. Of course, the cooking of the dough may also cook the material of the insert.

It is to be noted that the same mechanism for automatically removing a cooking member from a cooked bagel may be used to remove the cooking member from the dough prior to the cooking thereof. The dough is optionally chilled prior to removal of the cooking member to facilitate maintenance of the shape of the dough during and after the removal of the cooking member. In general, a flexible cooking member made of heat impervious material may be removed from an aliquot of dough before or after the cooking process.

Fig. 5 illustrates successive steps in a method for producing multiple bagel-type food products each having a filling material disposed in a center opening (not separately designated). a predetermined amount of dough is molded or otherwise

disposed about an elongate cooking member 108 to form a preform 110. Cooking member 108 is made of a material impervious to cooking temperatures.

Preform 110 comprises dough 106 molded into a cylindrical shape 112 coaxially surrounding cooking member 108. After the formation of preform 110, the preform is placed in a baking oven 114 where the dough 106 of preform is baked. Thereafter, the preform is removed from baking oven 114 and the cooking member 108 is removed, as indicated by an arrow 116, thereby producing a baked farinaceous tubular intermediate product 118. At that juncture, a nozzle 120 of a hydraulic type injector 122 is inserted into a lumen or chamber 124 in intermediate product 118. Injector 122 is actuated to inject comestible food composition or filling 104 into lumen 124. Subsequently, tubular intermediate product 118 with a substantially predetermined quantity of injected food composition 104 is placed on a platen 126 of a slicing device 128 having a pivotally movable flap 130 carrying a plurality of parallel blades 132. Flap 130 is pivoted, as indicated by an arrow 134, to slice tubular intermediate product 118 with the injected food composition 104 in a plurality of spaced planes (not shown). Upon a pivoting of flap 130 back into a rest position, as shown at 136, multiple bagel-type food products 102 each having a filling material 104 disposed in a center opening (not separately designated) are produced.

Alternative mechanisms are well within the ordinary skill in the art for holding a cooked bagel, on the one hand, and the cooking member 10, on the other hand, and for pulling the bagel and the cooking member in opposite directions to extricate the cooking member from the bagel. Where a multiplicity of bagels are disposed in a line so that

the end portions 18 of the respective cooking members are pointed in the same direction, a plate may be used to retain all of the bagels simultaneously. Similarly, a pair of bars may be used for clamping all of the protruding ends of the cooking members simultaneously. Various drives are operatively connected to the bars for shifting them
5 together towards the bagels, for clamping the bars and subsequently separating them from one another, and for moving the bars relative to the retaining plate and the held bagels.

Other mechanisms will occur to one skilled in the art for automatically bending cooking member 10 into an arcuate form and molding dough about the bent cooking member. For instance, cooking member 10 may be deposited on an inflated balloon inside a mold cavity. As dough is injected into the mold cavity, the balloon is deflated and withdrawn from the cavity. It is to be understood that the cooking of bagel dough to produce bagels need not include a boiling step, as is frequently the case in contemporary bagel production methods.

15 Also, in producing a bagel having an internal chamber for receiving an edible composition, the dough may be molded about an elongate flexible cooking member disposed in a linear configuration. The cooking member with the surrounding shaped dough is then bent into a desired circular configuration. In general, some adjustment in the configuration of the preform may be made after the placement of the dough about
20 the cooking member, at least where the cooking member is a flexible element or a manipulable edible composition.

It is also within the contemplation of the present invention that the cooking

member or insert is a flexible balloon type member which may be filled with oil or other fluid capable of withstanding boiling temperatures without volatilizing. The oil is siphoned off prior to removing the balloon or bag from the cooked or uncooked food product. In this case, the friction between the deflated cooking member and the doughy body may be so small that the restraint for holding the doughy body may simply be frictional forces of a surface on which the doughy body rests.

Fig. 6 depicts a filling injection assembly 150 comprising a tubular member 152 and a plunger 154 having an elongate shaft 156 provided at one end with a piston disk 158 and at an opposite end with a ring-shaped handle grip 160. Fig. 7 shows the filling injection assembly 150 of Fig. 6 in an assembled and loaded state. Piston disk 158 is disposed inside tubular member 152 as is a charge of a comestible filling material 162. Fig. 8 shows the piston assembly 150 of Fig. 7 after plunger 154 has been pushed in a distal direction towards an opening or mouth 164 of tubular member 152. The charge of comestible filling material 162 is shown as ejected or discharged from tubular member 152 through opening or mouth 164. Fig. 9 shows the loaded filling injection assembly of Fig. 7 disposed in a filling position relative to a bagel 166 provided with a toroidal chamber 168. Distal tip 170 of tubular member 152 is inserted through a hole 172 in bagel, which hole communicates with chamber 168.

As illustrated in Fig. 10, a tubular filling injection member 174 may be formed at a distal end with a tapered or conical section 176 for facilitating the insertion of that distal end through a hole formed in a bagel as discussed hereinabove. As depicted in Fig. 11, a tubular injection member 178 may be preformed to have an arcuate or curved

configuration, whereby the entire tubular member and not just the distal tip thereof may be inserted through a bagel hole into a toroidal bagel chamber. To that end, tubular member 178 is provided with a plunger member 180 (Fig. 12) have a resiliently flexible shaft 182 connected at one end to a piston plate 184 and at an opposite end to a ring-shaped handle grip 186.

In one business method for implementing bagel production, the filling injection assembly 150 of Fig. 6 is shipped to retail bagel stores in a packaged kit 188 as shown in Fig. 13. Multiple tubular members 152 (or 174, 178) and a like number of plungers 154 (or 180) are shipped together in different containers 190 and 192 or a common container 194 as illustrated in Fig. 14. Thus, tubular members 152 and plungers 154 of respective filling injection assemblies 150 may be shipped separately, in a disassembled state (Fig. 13) or, alternatively, connected to one another (Fig. 14).

The present business method contemplates that tubular filling injection members 152, 176 or 178 are shipped either in an empty state or preloaded with respective charges of bagel fillings. In the latter case, each package or container 190 or 194 may contain tubular filling injection members 152 (or 176 or 178) loaded with the same kind or different kinds of filling materials. Of course, where tubular filling injection members 152, 176 or 178 are preloaded with flowable comestible filling materials, it will be necessary in many case to refrigerate the entire packages during shipment.

As shown in Fig. 15, another assembly 196 for injecting filling material into hollowed bagels includes a tubular member 198 and a handle or grip 200. Grip 200 includes a central body section 202 provided at opposite ends with respective planar

flanges 204 and 206. Each flange 204 and 206 is in turn provided at a free end, opposite body section 202, with a pair of generally parallel, cylindrically arcuate fingers 208 spaced from one another by a gap 210 for receiving an end or edge portion of tubular member 198. Figs. 16 and 17 show grip 200 attached to tubular member 198.

5 Opposite ends of tubular member 198 are inserted into gaps 210 between fingers 208. To facilitate assembly of grips 200 to respective tubular members 198, flanges 204 and 206, as well as flanges 208 are made of a resilient material enable distortion of the flanges during an assembly operation.

Fig. 17 shows how the partially assembled filling injection assembly 196 of Fig. 10 16 is manipulated to load tubular member 198 with a desired filling at a retail establishment or even in the home. Grip 200 is held to enable the user to scoop an aliquot of flowable comestible filling material 212 from a bed (not separately designated) thereof on a container 214. During this procedure for loading tubular member 198 and thus assembly 196, tubular member 198 is angled slightly relative to the bed of filling 15 material 212 and is dragged along the surface of the bed, thereby driving a controllable amount of the filling material into tubular member 198. Before or after the filling of tubular member 198 in this manner, a plunger member (not shown) is partially inserted into one end of the tubular member in anticipation of discharge into a bagel or other hollow food product.

20 Figs. 18 and 19 depict a modified filling injection assembly having a tubular member 216 provided in a side wall (not separately designated) with a pair of apertures 218 and 220 for receiving cylindrically arcuate flanges 222 and 224 of a handle or grip

226.

As depicted in Fig. 20, a method for forming a food product (such as a hollow bagel preform) utilizes a support 228 such as a plate provided with a projection 230. Support plate 228 have be disposed on a conveyor (not shown) for moving the plate
5 between successive work stations. At a first work station 232, a first piece of generally flattened dough material 234 is disposed by a laying machine 236 on support plate 228 so that a central region 238 of the dough material 234 is located over projection 230. At a following work station 240, a 9- or 6-shaped cooking insert 242 is placed on dough piece 234 so that a generally circular portion 244 of cooking insert 242 encircles central
10 region 238 of dough piece 234 and encircles projection 230 of support 228 and so that a tail portion 246 of the cooking insert extends beyond a periphery of dough piece 234. Then, a second piece of generally flattened dough material 248 is automatically deposited by a machine 250 over dough piece 234 and at least circular portion 244 of cooking insert 242. Subsequently, a combined cutter and closure device 252 operates
15 to pressed the dough pieces 234 and 248 to one another along an inner circular zone 254 and an outer circular zone 256. Inner circular zone 254 is located inside circular portion 244 of cooking insert 242, while outer circular zone is located outside circular portion 244.

Device 252 includes an inner circular sealing lip 258 and an outer circular sealing
20 lip 260 which cooperate with support plate 228 to mash or knead dough pieces 234 and 248 to one another along circular zones 254 and 256, respectively. Device 252 further includes an inner circular blade 262 and an outer circular blade 266. Inner blade 262

cooperates with support plate 228 and projection 230 to cut circular sections of dough 264 from dough pieces 234 and 248, while outer blade 266 cooperates with support plate 228 to slice dough rings 268 from the peripheries of dough pieces 234 and 248. Device 252 thus acts to form a toroidal dough mass 270 surrounding circular portion 244 of cooking insert 242.

Projection 230 functions at least in part to locate circular portion 244 of cooking insert 242 on dough piece 234. Projection 230 also serves to hold cooking insert 242 in position during subsequent operations, including the deposition of dough piece 248 and the cutting and sealing of dough pieces 234 and 248 by device 252. As illustrated in Fig. 21, the functions of projection 230 may be alternatively performed by a 6- or 9-shaped recess 272 in a support plate 274.

It is to be noted that support 228 and device 252 may embody numerous variations in structure and operation to facilitate the automatic sealing and cutting of dough pieces 234 and 248 along circular zones 254 and 256. Accordingly, the different parts of device 252 (lips 258, 260, blades 262, 266) may be rigidly connected to one another and collectively driven for substantially simultaneous operation. In one modification of this embodiment, the various parts of device 252 may be staggered with respect to one another to cause, for instance, a sealing of dough pieces 234 and 248 to one another along circular zones 254 and 256 prior to the cutting of the dough pieces by blades 262 and 266. Alternatively, as discussed in detail hereinafter with reference to Figs. 22 *et seq.*, the different parts of device 252 (lips 258, 260, blades 262, 266) may be movably connected to one another and separately driven for sequential operation.

Fig. 22 shows a device for forming doughy bagel preform 324 (see Fig. 23F) surrounding a circular head portion 276 of a cooking insert 278. Device 22 includes a cylindrical inner blade or blade-holding member 280, a cylindrical outer blade or blade-holding member 282, and two cylindrical dough working or pressing members 284 and 286. Each member 280, 282, 284, and 286 is operatively connected by a respective mechanical linkage 288, 290, 292, 294 to a respective pneumatic cylinder 296, 298, 300, 302. Cylinders 296, 298, 300, 302 are selectively coupled to a source 304 of pressurized air and alternately to the atmosphere by a gang of valves 306 in turn operated by a programmer or controller 308.

Fig. 23A shows a pair of substantially flat dough pieces 310 and 312 sandwiching circular head portion 276 of cooking insert 278 and disposed therewith on a support plate 314 so that circular head portion 276 surrounds a generally centrally location projection 316 on plate 314. In a first step of a dough pressing and severing operation, shown in Fig. 23B, annular pressing member 286 is lowered to a position wherein annular regions or peripheries of dough pieces 310 and 312 are squeezed between a lower rim or edge 318 of pressing member 286 and support plate 314. The squeezed or pressed dough of pieces 310 and 312 are thereby worked together to seal the peripheries of the dough pieces to one another. Subsequently, pressing member 286 is raised and outer blade member 282 is lowered, as shown in Fig. 23C, to cut dough pieces 310 and 312 along the pressed or worked regions, on an outer side thereof, thus enabling separation and recycling of excess dough 320. Upon the severing of the excess dough 320 by outer blade member 282, pressing member 284 is then lowered,

as shown in Fig. 23D, to press portions of dough pieces 310 and 312 inside circular head portion 276 into connective contact with one another. Thereafter, pressing member 284 is elevated and inner blade member 280 is lowered, as shown in Fig. 23E to sever circular central portions (not designated) of dough pieces 310 and 312. The resulting doughy bagel preform 324 is a substantially toroidal doughy mass surrounding circular head portion 276 of cooking insert 278. Annular doughy ribs or ridges 326 and 328 may remain in place during subsequent cooking operations. These ribs or ridges 326 and 328, owing to their thinness, become brittle during cooking and are generally broken off during subsequently handling. Alternatively, it is possible to provide further mechanical processing of the bagel preform 324 to knead rims or ridges 326 and 328 into the main dough mass, without separating the toroidally deformed dough pieces 310 and 312.

Fig. 24 illustrates a bagel filling machine comprising a housing or frame 330 holding a plurality of cylindrical containers 332 of generally different comestible filling compositions, such as tuna fish salad, whitefish salad, salmon fish salad, chopped liver salad, various cream cheese or tofu pastes. Each container 332 is associated with a respective pneumatic cylinder 334 having a plunger 336 provided at a lower end with a pressure plate 338. Each pressure plate 338 is placed in contact with a movable lid or upper panel (not shown) of the respective filling container 332 for placing the filling in the container under pressure. Each container 332 is provided at a lower end with an outlet port 340, a hose 342, a nozzle 344, and a manually operable valve 346. a user merely inserts the nozzle 344 of a selected container 332 in a hole of a hollow cooked

bagel and manipulates the respective valve 346 to inject the desired filling into the bagel.

Fig. 25 depicts an alternative bagel filling machine including a rotatable frame, turntable or carousel 348 carrying a multiplicity of cylindrical filling containers 350 in a circular array. Each filling container 350 is provided at a lower end with an outlet port 352, a hose 354, a nozzle 356, and a manually operable valve 358. The machine of Fig. 25 includes a single pneumatic cylinder 360 for alternately pressurizing the different containers 350 brought into registration or alignment with the pneumatic cylinder at a filling station (not designated). Cylinder 360 has a vertically oriented plunger element 362 provided at a lower end with a disk-shaped flange or pressure plate 364. Cylinder 360 is operatively connected to a valve (not shown) and a programmer or controller (not shown) which induces plunger 362 to retract when turntable or carousel is to be rotated to align a different filling container 350 with cylinder 360. Upon alignment, plunger is lowered to place pressure plate 364 into contact with a shiftable upper container panel (not shown) inside the newly aligned container 350. Plunger continues in a downward stroke until the pressure exerted equals a predetermined limit (as detected by a sensor, not shown). Upon registration and pressurization of a selected container 350, a user inserts the nozzle 356 of the selected container in a hole of a hollow cooked bagel and manipulates the respective valve 358 to inject the desired filling into the bagel.

Although the invention has been described in terms of particular embodiments and applications, one of ordinary skill in the art, in light of this teaching, can generate additional embodiments and modifications without departing from the spirit

of or exceeding the scope of the claimed invention. Accordingly, it is to be understood that the drawings and descriptions herein are proffered by way of example to facilitate comprehension of the invention and should not be construed to limit the scope thereof.

2007-07-26